MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Amikon cover with selected official Emerson pages

OVATION HIGH-DENSITY ANALOG INPUT

## 5X00502G01

ANALOG INPUT PERSONALITY MODULE

OFFICIAL SOURCES

Emerson Ovation I/O Overview PWS_002864 [9], applicable series architecture. Selected pages retain their original content, color and aspect ratio.

# Ovation™ I/O Overview

## Features

- Modular, plug-in components support long-term process reliability
- Modules are installed and configured quickly and easily with single-point DIN rail fastening
- Built-in connectors eliminate power and communications wiring
- Electronic ID identifies module type, group, serial number and revision
- Fewer module styles reduce spare parts inventory costs
- Redundant power supplies deliver system reliability
- “Hot swapping” streamlines system maintenance
- Standardized status indicators offer color-coded diagnostic messages
- Remote Ovation I/O provides a flexible, cost-effective means to distribute I/O modules to strategic locations throughout the plant



## Introduction

Emerson’s Ovation™ control technology is designed to support long-term process reliability and expandability.

With modular plug-in components, Ovation I/O delivers embedded advanced control applications with built-in fault tolerance and system diagnostics.

With their inherent flexibility, Ovation I/O modules convert input signals and create output signals, performing a multitude of functions. Specialized I/O modules are also available.

## Simplified Maintenance

Standardized assembly style simplifies maintenance and reduces spare parts inventory costs.

Single-point DIN rail fastening makes installation and configuration quick and easy. Built-in connectors eliminate power and communications wiring.

Ovation I/O modules are software configurable, therefore no jumpers or thumb wheels are necessary. Their advanced electronics also deliver low power consumption.

# Ovation I/O Architecture

## The Base

Ovation packaging reduces the system footprint by using base units which attach to mounting plates by DIN rail; these hold four independent Ovation I/O modules of any style. This approach simplifies maintenance by making it easy to install, move or replace individual base units.

Base unit features include:

- Field terminal blocks that accept two 14 AWG or a single 12 AWG
- I/O bus communications built into the base
- I/O modules automatically addressed by location
- I/O modules may reside in any location
- I/O module redundant power distribution
- No interconnecting cables for I/O bases
- Built-in spare fuse holders and strip gauge in base

The base unit's high-impact plastic housing protects the backplane, exposing only the connectors as modules are removed.

## The I/O Module

The I/O module includes an electronic module and a personality module or cavity insert. The I/O module converts field signals into data and sends it to the controller. Electronic module styles include digital and analog input and output modules, contact inputs, RTD inputs, pulse accumulator / counter, HART input and output modules, FOUNDATION Fieldbus, Profibus, DeviceNet, Ethernet and serial link controller modules.

I/O modules offer a number of protective features including:

- Signal conditioning, part of the surge-withstand feature, dissipates voltage "spikes" to protect the electronics
- Fuses protect the circuit in case of a short in the field device line

Each module is "hot swappable," allowing it to be removed and replaced without interrupting system power or using mechanical tools. The standard Ovation system configuration allows for up to 128 I/O modules in a local configuration. This modular approach simplifies maintenance by requiring less assembly and offering a compact and uniform architecture.

# Controller I/O Capabilities

The Ovation controller supports multiple I/O capabilities in various combinations, including:

- Hardware I/O interfaces to Ovation I/O
- Q-Line I/O plus software I/O in the form of simulated I/O
- Virtual I/O generally communicated from OEM models and systems

Ovation I/O has two methods of implementation: locally within the controller and remotely away from the controller. Remote I/O provides a means to distribute I/O throughout a plant.

| Controller I/O Capabilities | | |
|---|---|---|
| **Item** | **Capability** | |
| **Local Ovation I/O** | 2 sets of up to 8 independent branches of 8 modules per branch for a total of 128 modules | |
| **Remote Ovation I/O*** | Up to 16 nodes of 8 branches of 8 modules per branch for a total of 64 modules per node | |
| **Local Q-Line I/O*** | 1 node of 48 Q cards | |
| **Local Q-Line I/O*** | 1 additional node of 48 Q cards | |
| **Remote Q-Line I/O*** | Up to 8 nodes of 48 cards | |
| **Smart device capability** | FOUNDATION™ Fieldbus – PROFIBUS - DeviceNet | |
| **Virtual I/O capability ** (via Ethernet TCP/IP and standard protocols)** | Allen-Bradley PLCs DF-1<br>GE Mark V/VI GSM<br>Modbus/TCP<br>GE Genius I/O | Toshiba turbine control<br>MHI turbine control<br>External Ovation network |
| **Note**:<br>* Refer to the Ovation controller documentation for valid combinations of the above listed hardware interface capabilities since not all can be supported concurrently.<br>** The valid combinations of software I/O interfaces depend upon the ports available and controller device capability. | | |

## Ovation Local I/O

The Ovation controller can directly support up to 16 independently driven branches of Ovation I/O. For local I/O, all modules reside in up to four standard cabinets, which are placed side by side. All field wiring leads to these cabinets.

| Ovation Local I/O Specifications | |
|---|---|
| **Max branches per controller** | 16 branches |
| **Max I/O modules per branch** | 8 modules |
| **Max I/O modules per controller** | 128 modules |
| **Max local I/O bus length** | 20 m (60 ft) |

## Ovation Redundant I/O

Redundant Ovation I/O modules are installed in the same fashion as standard Ovation I/O modules, but are associated in pairs located in adjacent branches.

The module pairs exchange health, status and I/O information via their personality module interconnections. This approach allows the user to take advantage of I/O redundancy by wiring the field terminations into a single terminal block on the primary I/O base, with no special control strategy configuration required.

Redundancy is applied and configured during I/O setup, allowing the Ovation system to automatically read and compare during normal operation, the I/O channels of both modules and determining which value to use. When a fault is detected the system automatically switches to the backup module thus increasing reliability and availability of the process inputs or outputs.

## Ovation Remote I/O

Ovation remote I/O places I/O modules close to field devices, in contrast to local I/O modules. Remote I/O uses redundant fiber optic cables that stretch from the controller cabinet to up to 4000 meters away — to a cabinet that houses the I/O modules. By placing the I/O modules closer to the transmitters and actuators, field cables can be made shorter.

This significantly reduces the amount of wiring required throughout the plant, delivering substantial cost savings significantly. Interfaces for both local and a remote I/O can reside the same controller. Multiple remote I/O locations can be connected to the same controller.

The remote I/O system is easy to configure and requires no database modification. Again, I/O selection type, whether local or remote, is made during configuration on the controller.

The remote I/O system offers a level of reliability unmatched in the industry through, redundant communications, periodic communication diagnostics and error correction. When remote I/O is implemented in a controller, the remote I/O subsystem provides a flexible, cost-effective means to distribute I/O modules to strategic locations throughout the plant.

| Remote I/O Specifications | |
|---|---|
| **Max. remote nodes** | 16 nodes |
| **Max. I/O modules per node** | 64 (8 branches with 8 modules for each branch) |
| **Max. I/O modules per controller** | 512 modules |
| **Remote I/O bus configuration** | 10 BASE-FL Ethernet physical layer with a proprietary protocol |
| **Remote I/O cycle time** | <100 microseconds (no repeaters) |
| **Standard remote communications media** | Fiber optic |
| **Maximum cable length for 850 nm fiber-optic media** | 4 km. Distances of 6 km can be achieved with repeaters (up to two repeaters) |

## Q-Line I/O (Remote and Local)

The Ovation controller additionally supports both local and remote Q-Line I/O, typically used in Emerson's WDPF control system. This interface capability provides the ability to reuse the majority of the existing configurations.

## Simulated I/O

Another type of I/O supported by the Ovation controller is simulated I/O, where the controller can be directed to interface to I/O generated by a software model accessible through the Ovation network.

## Virtual I/O

The Ovation controller supports a number of standard 10/100 Ethernet based interface protocols. This capability allows OEM systems which support these same protocols as a standard to intercommunicate with the Ovation system. This ability provides remote operation, monitoring and control where appropriate.

# Ovation I/O Summary

| Category | Ovation I/O Type |
|---|---|
| **Analog Inputs** | Analog input (13-bit), 8-channel |
| | Analog input, 16-channel |
| | HART analog input (16-bit), 8-channel |
| | HART high-density analog input, 16-channel |
| | HART high-performance analog input (16-bit), 8-channel |
| | High impedance analog input, 8-channel |
| | High speed analog input (14-bit), 8-channel |
| | RTD analog input, 4-channel |
| | RTD analog input, 8-channel |
| | RTD analog input, 16-channel |
| | RTD compact analog input, 8-channel |
| | Thermocouple analog input, 16-channel |
| **Analog Outputs** | Analog output 4-channel |
| | HART analog output (14 bit), 8-channel |
| | HART high-density analog output, 8-channel |
| | HART high-performance analog output (16-bit), 4-channel |
| **Bus Interfaces** | DeviceNet |
| | Foundation Fieldbus |
| | Profibus |
| | Ethernet link controller (ELC) |
| **Digital Inputs** | Compact contact digital input, 16-channel |
| | Compact digital input, 16-channel |
| | Contact digital input, 16-channel |
| | Digital input, 16-channel |
| | Digital input, 32-channel |
| | Redundant digital input, 16-channel |
| | Sequence of events contact digital input compact 16-channel |
| | Sequence of events contact digital input, 32-channel |
| | Sequence of events digital input, 16-channel |
| | Sequence of events enhanced compact digital input, 16-channel |
| **Digital Outputs** | Digital output high side, 16-channel |
| | Digital output high side, 32-channel |
| | Digital output, 16-channel |
| | Relay output panel, 16-channel |
| | Relay output panel, 32-channel |

| Category | Ovation I/O Type |
|---|---|
| **Specialty** | Excitation controller |
| | Loop interface, 6-channel |
| | Machinery Health Monitor |
| | Pulse accumulator |
| **Turbine** | Servo driver |
| | Speed detector |
| | Valve positioner |

# Summary

Ovation I/O significantly improves system performance, speed and reliability. State-of-the-art electronics provides low power consumption and heat dissipation. Remote I/O reduces costs by placing modules closer to field devices, thereby reducing field wiring. Streamlined design standardizes inventory, requiring fewer spare parts. Fast, effective and reliable, simple pull-and-plug card swapping means the Ovation I/O system is always online available and fully functional.

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